Anadromous Fish Restoration in Chesapeake Bay

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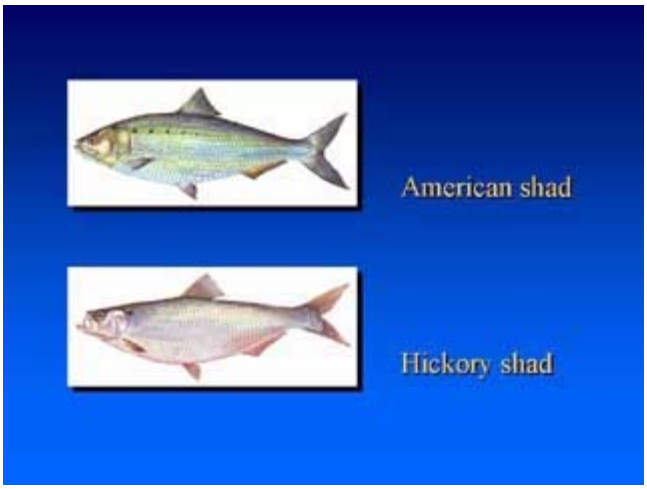

American shad was once the most valuable commercial and recreational fish in Maryland's Chesapeake Bay. Spawning populations began a drastic decline early in the 20th century and many river stocks were extirpated by the 1970s. Nearly twenty years of zero harvest has not stimulated their recovery in most of Maryland's rivers, primarily due to lack of an adequate supply of adult spawners. In 1994, Maryland Department of Natural Resources began a stocking program to restore American shad through hatchery introductions. Hickory shad populations also experienced a similar decline to their better known relatives. In 1996 hickory shad were incorporated into our restoration effort when resurgence of the Deer Creek population provided seed stock for hatchery efforts. Several mid-Atlantic states have conducted hatchery programs, some dating back to the late 1800s when shad catches first started decreasing. Even through modern times, shad hatchery programs have traditionally utilized a culture process known as strip spawning. This method entails nighttime gill netting on the spawning grounds to collect shad. All fish captured are sacrificed as eggs and milt are extracted. This process is limited by the difficulty in obtaining an ample supply of males and running ripe females. In addition, shad exhibit a reproductive strategy known as asynchronous spawning. This means shad only mature a portion of their available eggs at any one time. Strip spawning shad thus results in utilizing only a fraction of the potential fecundity of the fish. Clearly another method would have to be developed to begin a hatchery program in Maryland due to the low numbers of adult spawners available to us. We developed a new technique to induce spawning in fish using synthetic reproductive hormones. We intercept green fish migrating to their spawning ground. We obtain broodstock from an elevator style fish lift at the Conowingo dam or directly from recreational anglers in the Susquehanna River. Fish are implanted with a hormone pellet developed by the Center of Marine Biotechnology (University of Maryland), placed in a DNR tank truck and transported to Manning State Fish Hatchery in Waldorf, Maryland. Fish are placed in spawning tank systems and allowed to spawn as they would in the wild. Fertilized eggs are removed from the spawning tanks and grown to larval size. The Potomac Electric Power Company assists us in our efforts by operating a fully staffed intensive culture facility to grow juvenile fish. All fish receive a distinct mark to later distinguish hatchery fish from wild fish. Fish are marked by either chemical immersion in an oxytetracycline (OTC) solution or mechanically implanted with a one millimeter long coded wire tag. OTC is deposited in calcium and fluoresces under ultraviolet light. DNR biologists, using a special microscope, can detect patterns of this fluorescence in the daily growth rings in the fish's otoliths (ear bones). This allows identification of the river-specific marks we apply to the fish. Wire tag data provides even more specific information. We are currently concentrating on restoring populations in the Choptank River and Patuxent River. To date the program has stocked 9.5 million American shad and 42 million hickory shad in these tributaries. In order to assess the success of the project, field sampling is conducted. Data is used to calculate stock assessment parameters such as juvenile survival and pre-migratory stock size. Distribution of fish in different areas of the tributaries provides valuable information about the habitat requirements of pre-migratory alosids. Sampling also allows analysis of survival data to target specific environmental conditions for maximum larval stocking success in each tributary. After the first growing season, juveniles migrate to the ocean where they spend the next several years before returning as adults. We can then sample for these adults as they enter the historic spawning areas of the rivers where they were stocked. This data will provide information on shad stock-recruitment dynamics in these tributaries. Return rates of adult spawners will determine what level of stocking is needed to produce a self-sustaining spawning population. Our goal is to restore naturally reproducing populations of shad in these rivers. Ultimately, juvenile surveys will indicate

when natural recruitment is sufficient to allow us to redirect our efforts to other tributaries. Since 1994, hundreds of hatchery-produced American shad and hickory shad juveniles have been recaptured in the Choptank River and Patuxent River. These represent the first shad juveniles caught in these tributaries in three decades. In 1999 we documented a spawning run of hatchery-produced adult American shad and hickory shad in the Patuxent River and Choptank River. Early returns this spring indicate larger numbers of hatchery fish returning as adults. Stocking a fish only a fraction of an inch long and then encountering it several years later as a foot and a half long adult is quite a thrill. We hope that our efforts will help these species return to the levels of abundance that they once exhibited.